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EOSDIS Core System Project

HDF-EOS 2.7 Version Description Document (VDD) for the ECS Project

November 2000

Raytheon Company
Upper Marlboro, Maryland

HDF-EOS 2.7 Version Description Document (VDD) for the ECS Project

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RESPONSIBLE ENGINEER

Charles Poole /s/	11/23/00
<hr/>	
Charles Poole, Staff Engineer EOSDIS Core System Project	Date

SUBMITTED BY

William Knauss /s/	11/23/00
<hr/>	
William Knauss, Director of Development EOSDIS Core System Project	Date

Raytheon Company
Upper Marlboro, Maryland

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Preface

This document accompanies the delivery of HDF-EOS 2.7 (Hierarchical Data Format - Earth Observing System) software for the ECS project. It is a formal deliverable and has been placed under configuration control by the EOSDIS Core System (ECS) Science Data Processing Segment. Changes to this document shall be made by document change notice (DCN) or by complete revision.

This HDF-EOS version is directed at Earth Observing System (EOS) instrument data providers who will deliver code to the ECS Version 2.0 (6A) Distributed Active Archive Centers (DAACs). It describes the HDF-EOS library tools. EOS data consumers will also use it. HDF files consist of a directory and a collection of data objects. Every data object has a directory entry, containing a pointer to the data object location, and information defining the datatype. Additions to traditional HDF are required to fully support these datatypes.

This document describes three new EOS specific datatypes – *point*, *swath*, and *grid*. Each of these new datatypes is constructed using conventions for combining standard HDF datatypes and is supported by a special application programming interface (API) which aids the data product user or producer in the application of the conventions. The APIs allow data products to be created and manipulated in ways appropriate to each datatype, without regard to the actual HDF objects and conventions underlying them. The sum of these new APIs comprises the HDF-EOS library.

Any questions regarding distribution should be addressed to:

Data Management Office
ECS Project Office
Raytheon Systems Company
1616 McCormick Drive
Upper Marlboro, MD 20774-5301

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Abstract

This document describes the delivery contents of HDF-EOS 2.7 software. HDF refers to the scientific data format standard selected by NASA as the baseline standard for EOS and HDF-EOS refers to EOS conventions for using HDF. The three interfaces described include – Point, Swath, and Grid.

It briefly describes the capabilities of the product, provides an inventory of the delivery, lists unresolved problems, and addresses issues such as special operating instructions, system limitations, and disclaimer notices for public domain software used in the product.

Keywords: API, HDF-EOS, standard, data, product, disk, format, point, grid, swath

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Change Information Page

List of Effective Pages			
Page Number		Issue	
Title		Original	
iii through x		Original	
1-1 and 1-2		Original	
2-1 and 2-2		Original	
3-1 through 3-8		Original	
4-1 through 4-4		Original	
5-1 through 5-6		Original	
A-1 and A-2		Original	
B-1 and B-2		Original	
C-1 and C-2		Original	
AB-1 through AB-6		Original	
Document History			
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Contents

Preface

Abstract

1. Introduction

1.1	Identification of Document	1-1
1.2	Scope of Document	1-1
1.3	Purpose and Objectives of Document	1-1
1.4	Document Status and Schedule	1-1
1.5	Document Organization	1-1

2. Related Documentation

2.1	Parent Documents	2-1
2.2	Applicable Documents	2-1

3. Product Description

3.1	Product Description and General Capabilities	3-1
3.2	HDF-EOS Version 2.7 Routine Listing	3-1
3.2.1	PT API Routines	3-2
3.2.2	SW API Routines	3-3
3.2.3	GD API Routines	3-4
3.3	HDF-EOS 2.7 Test Tools and Drivers	3-6
3.4	HDF-EOS 2.7 Hierarchical Data Format	3-6
3.5	HDF-EOS Users Guide	3-7

4. Product Inventory

4.1	HDF-EOS 2.7 Tar File Listing.....	4-1
4.2	HDF-EOS2.7v1.00_TestDrivers.tar Listing	4-3
4.3	Documentation.....	4-4
4.4	Archive Tape.....	4-4

5. Non-Conformance Status

5.1	Known Problems with HDF-EOS 2.7.....	5-1
5.2	HDF-EOS 2.7 Non-Conformance Reports (Close Status).....	5-1
5.3	HDF-EOS 2.7 Non-Conformance Reports (Open Status)	5-5

Appendix A. Build/Installation Instructions

Appendix B. User Feedback Procedures

Appendix C. Test Baseline Configuration

Abbreviations and Acronyms

1. Introduction

1.1 Identification of Document

This document is a Version Description Document (VDD) prepared using NASA-STD-2100-91 as a guide. It is submitted as required for the Earth Observing System Data and Information System (EOSDIS) Core System (ECS), contract number NAS5-60000.

1.2 Scope of Document

This VDD specifies the delivery contents of the HDF-EOS 2.7 software and accompanying documentation.

1.3 Purpose and Objectives of Document

The purpose of this VDD is to describe the contents of the delivery of HDF-EOS 2.7 software. The document briefly describes all tools that incorporate the delivery, provides an inventory of the delivery, lists unresolved problems, and addresses special issues such as special operating instructions, system limitations, and disclaimer notices for public domain software used in the library.

1.4 Document Status and Schedule

This Version Description Document for HDF-EOS 2.7 is submitted as a final document. Any changes to HDF-EOS 2.7 that require a subsequent version to be released will be described in a new Version Description Document.

1.5 Document Organization

The format and contents of this document comply with NASA-DID-P500 and NASA-DID-999 as defined in NASA-STD-2100-91.

- Introduction — Introduces the VDD scope, purpose, objectives, status, schedule and document organization.
- Related Documentation — Provides a bibliography of reference documents for the VDD organized by parent and binding subsections.
- Product Description — Describes the general capabilities and product contents.
- Inventory — Lists tar file listings for HDF-EOS and test drivers, documentation, and archive tape.
- Non-conformance Status — Discusses known problems with HDF-EOS Version 2.7 and lists Non-conformance Reports with open status.
- Appendices — Contain supplemental information such as: Build/installation instructions, user feedback procedures, and the test baseline configuration.

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2. Related Documentation

2.1 Parent Documents

The following documents are the parent from which this document's scope and content derive:

423-41-01	EOSDIS Core System Statement of Work
423-16-02	Science Data Processing (SDP) Toolkit Requirements Specification for the ECS Project

2.2 Applicable Documents

The following documents are directly applicable to this plan to the extent referenced herein. In the event of conflict between any of these documents and this plan, the plan shall take precedence.

170-TP-600	HDF-EOS Library Users Guide for the ECS Project, Volume 1: Overview and Examples
170-TP-601	HDF-EOS Library Users Guide for the ECS Project Volume 2: Function Reference Guide
175-WP-001	HDF-EOS Primer for Version 1 EOSDIS
333-CD-600	Release 6A SDP Toolkit Users Guide for the ECS Project
814-RD-600	Release 6A SCF Toolkit 5.2.7 Version Description Document (VDD) for the ECS Project
NASA-STD-2100-91	NASA Software Documentation Standard, Software Engineering Program

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3. Product Description

This section describes the general capabilities of HDF-EOS 2.7 and the tools and test drivers provided.

3.1 Product Description and General Capabilities

HDF-EOS is an extension of NCSA (National Center for Supercomputing Applications) HDF and uses HDF library calls as an underlying basis. Version 4.1r3 of HDF is used. The library tools are written in C language and a FORTRAN interface is provided. The current version contains software for creating, accessing and manipulating grid, point and swath structures. Also included are overviews of the interfaces, function-by-function calling sequences, explanations, and code examples. Included also are tools for subsetting and data projection. EOSView, our viewing tool has been revised to accommodate the current version of the libraries.

HDF is the scientific data format standard selected by NASA as the baseline standard for EOS. These libraries are aimed at EOS data producers and consumers, who will develop their data into increasingly higher order products. These products range from calibrated Level 1 to Level 4 model data. The primary use of HDF-EOS libraries will be to create structures for associating geolocation data with their associated science data. Producers through use of supplied libraries specify this association. Most EOS data products identified fall into categories of grid, point, or swath structures. These structures are implemented in the current version of the libraries. Services based on geolocation information will be built on HDF-EOS structures. Producers of products not covered by these structures (for example, non-geolocated data) can use standard HDF libraries.

In the ECS (EOS Core System) production system, the HDF-EOS libraries will be used in conjunction with SDP (Science Data Processing) Toolkit software. The primary tools used in conjunction to HDF-EOS libraries will be those for metadata handling, process control, and status message handling. Metadata tools will be used to write ECS inventory and granule specific metadata into HDF-EOS files, while the process control tools will be used to access physical file handles used by the HDF tools.

3.2 HDF-EOS Version 2.7 Routine Listing

The HDF-EOS library is comprised of three new APIs:

- Point (PT) interface – designed to support data that has associated geolocation information, but is not organized in any well-defined spatial or temporal way
- Swath (SW) interface – tailored to support time-ordered data such as satellite swaths (which consist of a time-ordered series of scanlines), or profilers (which consist of a time-ordered series of profiles)

- Grid (GD) interface – designed to support data that has been stored in a rectilinear array based on a well defined and explicitly supported projection.

The HDF library is accessible from both C and FORTRAN programs because it contains a set of “wrapper” functions that make the underlying C code callable from FORTRAN. HDF provides two names for each function: one for use in C programming and a shorter version for use in FORTRAN programming. The following HDF-EOS Routine listings provide a description of the tools.

3.2.1 PT API Routines

All C routine names in the point data interface have the prefix “PT” and the equivalent FORTRAN routine names are prefixed by “pt.” The PT routines are grouped into categories that are described in the HDF-EOS User’s Guide. The PT function calls are listed in the following table.

Routine Name		Description
C	FORTTRAN	
PTopen	ptopen	creates a new file or opens an existing one
PTcreate	ptcreate	creates a new point data set and returns a handle
PTattach	ptattach	attaches to an existing point data set
PTdetach	ptdetach	releases a point data set and frees memory
PTclose	ptclose	closes the HDF-EOS file and deactivates the point interface
PTdeflevel	ptdeflev	defines a level within the point data set
PTdeflinkage	ptdeflink	defines link field to use between two levels
PTwritelevel	ptwrlev	writes (appends) full records to a level
PTreadlevel	ptrdlev	reads data from the specified fields and records of a level
PTupdatelevel	ptuplev	updates the specified fields and records of a level
PTwriteattr	ptwrattr	creates or updates an attribute of the point data set
PTreadattr	ptrdattr	reads existing attribute of point data set
PTnlevels	ptnlevs	returns the number of levels in a point data set
PTnrecs	ptnrecs	returns the number of records in a level
PTnfields	ptnflds	returns number of fields defined in a level
PTlevelinfo	ptnlevinfo	returns information about a given level
PTlevelindx	ptlevidx	returns index number for a named level
PTbcklinkinfo	ptbmlinkinfo	returns link field to previous level
PTfwdlinkinfo	ptflinkinfo	returns link field to following level
PTgetlevelname	ptgetlevname	returns level name given level number
PTsizeof	ptsizeof	returns size in bytes for specified fields in a point
PTattrinfo	ptattrinfo	returns information about point attributes
PTinqattrs	ptinqattrs	retrieves number and names of attributes defined

Routine Name		Description (cont.)
C	FORTRAN	
PTinqpoint	ptinqpoint	retrieves number and names of points in file
PTgetrecnums	ptgetrecnums	returns corresponding record numbers in a related level
PTdefboxregion	ptdefboxreg	define region of interest by latitude/longitude
PTregioninfo	ptreginfo	returns information about defined region
PTregionrecs	ptregrecs	returns # of records and record #s within region
PTextractregion	ptextreg	read a region of interest from a set of fields in a single level
PTdeftimeperiod	ptdeftmeper	define time period of interest
PTperiodinfo	ptperinfo	returns information about defined time period
PTperiodrecs	ptperrecs	returns # of records and record #s within time period
PTextractperiod	ptextper	read a time period from a set of fields in a single level
PTdefvrtregion	ptdefvrtregion	Define a region of interest by vertical field

3.2.2 SW API Routines

The SW interface consists of routines for storing, retrieving, and manipulating data in swath data sets. All C routine names in the swath data interface have the prefix “SW” and the equivalent FORTRAN routine names are prefixed by “sw.” The SW routines are grouped into categories that are described in the HDF-EOS User’s Guide. The SW function calls are listed in the following table.

Routine Name		Description
C	FORTRAN	
SWopen	swopen	opens or creates HDF file in order to create, read, or write a swath
SWcreate	swcreate	creates a swath within the file
SWattach	swattach	attaches to an existing swath within the file
SWdetach	swdetach	detaches from swath interface
SWclose	swclose	closes file
SWdefdim	swdefdim	defines a new dimension within the swath
SWdefdimmap	swdefmap	defines the mapping between the geolocation and data dimensions
SWdefidxmap	swdefimap	defines a non-regular mapping between the geolocation and data dimension
SWdefgeofield	swdefgfld	defines a new geolocation field within the swath

Routine Name		Description (cont.)
C	FORTRAN	
SWdefdatafield	swdefdfld	defines a new data field within the swath
SWdefcomp	swdefcomp	defines a field compression scheme
SWwritegeometa	swwrgmeta	writes field metadata for an existing swath geolocation field
SWwritedatameta	swwrdmeta	writes field metadata for an existing swath data field
SWwritefield	swwrfld	writes data to a swath field
SWreadfield	swrdfld	reads data from a swath field.
SWwriteattr	swwrattr	writes/updates attribute in a swath
SWreadattr	swrdattr	reads attribute from a swath
SWsetfillvalue	swsetfill	sets fill value for the specified field
SWgetfillvalue	swgetfill	retrieves fill value for the specified field
SWinqdims	swinqdims	retrieves information about dimensions defined in swath
SWinqmaps	swinqmaps	retrieves information about the geolocation relations defined
SWinqidxmaps	swinqimaps	retrieves information about the indexed geolocation/data mappings defined
SWinqgeofields	swinqgflds	retrieves information about the geolocation fields defined
SWinqdatafields	swinqdflds	retrieves information about the data fields defined
SWinqattrs	swinqattrs	retrieves number and names of attributes defined
SWnentries	swnentries	returns number of entries and descriptive string buffer size for a specified entity
SWdiminfo	swdiminfo	retrieve size of specified dimension
SWmapinfo	swmapinfo	retrieve offset and increment of specified geolocation mapping
SWidxmapinfo	swimmapinfo	retrieve offset and increment of specified geolocation mapping
SWattrinfo	swattrinfo	returns information about swath attributes
SWfieldinfo	swfldinfo	retrieve information about a specific geolocation or data field
SWcompinfo	swcompinfo	retrieve compression information about a field
SWinqswath	swinqswath	retrieves number and names of swaths in file
SWperiodinfo	swperinfo	returns information about a defined time period
SWregionindex	swregidx	returns information about the swath region
SWupdateidxmap	swupimap	update map index for a specified region
SWgeomapinfo	swgmapinfo	retrieve type of dimension mapping for a dimension
SWdupregion	swdupregion	duplicate a region or time period

3.2.3 GD API Routines

The table below provides the routines available for storing and retrieving HDF-EOS *Grid Data*. All C routine names in the grid data interface have the prefix “GD” and the equivalent FORTRAN routine names are prefixed by “gd.” The GD routines are grouped into categories, which are described in the HDF-EOS User’s Guide.

Routine Name		Description
C	FORTAN	
GDbkSOMoffset	n/a	writes block SOM offset values (special function for SOM MISR data)
GDopen	gdopen	creates a new file or opens an existing one
GDcreate	gdcreate	creates a new grid in the file
GDattach	gdattach	attaches to a grid
GDdetach	gddetach	detaches from grid interface
GDclose	gdclose	closes file
GDdeforigin	gddeforigin	defines origin of grid
GDdefdim	gddefdim	defines dimensions for a grid
GDdefproj	gddefproj	defines projection of grid
GDdefpixreg	gddefpixreg	defines pixel registration within grid cell
GDdeffield	gddeffld	defines data fields to be stored in a grid
GDdefcomp	gddefcomp	defines a field compression scheme
GDwritefieldmeta	gdwrmeta	writes metadata for field already existing in file
GDwritefield	gdwrfld	writes data to a grid field.
GDreadfield	gdrfld	reads data from a grid field
GDwriteattr	gdwrattr	writes/updates attribute in a grid.
GDreadattr	gdrdattr	reads attribute from a grid
GDsetfillvalue	gdsetfill	sets fill value for the specified field
GDsettilecomp	n/a	function allows the user to have a field with fill values and use tiling and compression
GDgetfillvalue	gdgetfill	retrieves fill value for the specified field
GDinqdims	gdinqdims	retrieves information about dimensions defined in grid
GDinqfields	gdinqflds	retrieves information about the data fields defined in grid
GDinqattrs	gdinqattrs	retrieves number and names of attributes defined
GDnentries	gdnentries	returns number of entries and descriptive string buffer size for a specified entity
GDgridinfo	gdgridinfo	returns dimensions of grid and X-Y coordinates of corners
GDprojinfo	gdprojinfo	returns all GCTP projection information
GDdiminfo	gdldiminfo	retrieves size of specified dimension.
GDcompinfo	gdcompinfo	retrieve compression information about a field
GDfieldinfo	gdfldinfo	retrieves information about a specific geolocation or data field in the grid
GDinqgrid	gdinqgrid	retrieves number and names of grids in file
GDattrinfo	gdattrinfo	returns information about grid attributes
GDorigininfo	gdorginfo	return information about grid origin
GDpixreginfo	gdpreinfo	return pixel registration information for given grid
GDdefboxregion	gddefboxreg	define region of interest by latitude/longitude
GDregioninfo	gdreginfo	returns information about a defined region

Routine Name		Description (cont.)
C	FORTTRAN	
GDextractregion	gdextreg	read a region of interest from a field
GDdeftimeperiod	gddeftmeper	define a time period of interest
GDdefvrtregion	gddefvrtreg	define a region of interest by vertical field
GDgetpixels	gdgetpix	get row/columns for lon/lat pairs
GDgetpixvalues	gdgetpixval	get field values for specified pixels
GDinterpolate	gdinterpolate	perform bilinear interpolation on a grid field
GDdupregion	gddupreg	duplicate a region or time period
GDdeftile	gddeftle	define a tiling scheme
GDtileinfo	gdtleinfo	returns information about tiling for a field
GDsettilecache	gdsettleche	set tiling cache parameters
GDreadtile	gdrdtle	read data from a single tile
GDwritetile	gdwrtile	write data to a single tile

3.3 HDF-EOS 2.7 Test Tools and Drivers

Included in the software delivery of HDF-EOS 2.7 is a tar file that contains test driver programs. These test programs are provided to aid the user in the development of software using the HDF-EOS libraries. The user may run the same test cases as included in this file to verify that the software is functioning correctly. These programs were written to support the internal testing and are not an official part of the delivery. Users make use of them at their own risk. No support will be provided to the user of these programs. The tar file contains source code for a driver in C and FORTRAN for each tool; sample output files, and input files and/or shell scripts, where applicable.

The sample following UNIX command creates a directory called testdrivers beneath the current directory containing all these test files.

```
zcat HDF-EOS2.7v1.00_TestDrivers.tar.Z | tar xvf -
```

3.4 HDF-EOS 2.7 Hierarchical Data Format

HDF refers to the scientific data format standard selected by NASA as the baseline standard for EOS and HDF-EOS refers to EOS conventions for using HDF. This document provides information on the use of the three interfaces included in HDF-EOS – Point, Swath, and Grid.

The Hierarchical Data Format (HDF) has been selected by the EOSDIS Project as the format of choice for standard product distribution. HDF is a *disk format* and *subroutine library* for storage of most kinds of scientific data. As a *disk format*, HDF files consist of a directory and an unordered set of binary data objects. Each directory entry describes the location, the type, and the size of these binary objects.

The *HDF subroutine library* is designed to be easy for C and FORTRAN programmers to use. The HDF library consists of callable routines, each of which belongs to a particular *interface*.

Each interface within these layers address a particular HDF function or a particular HDF data structure, such as arrays, tables, and annotations.

3.5 HDF-EOS Users Guide

The purpose of the *HDF-EOS Library User's Guide for the ECS Project, Volume 1: Overview and Examples* (170-TP-600-001) is to provide EOS instrument data processing software developers and scientists with knowledge of HDF-EOS 2.7 functionality. The Users Guide also provides a listing of routine calling sequences, detailed descriptions, and examples of usage.

The *HDF-EOS Library User's Guide for the ECS Project Volume 2: Function Reference Guide* (170-TP-601-001) is intended for use by anyone who wishes to use the HDF-EOS library to create or read EOS data products. Users of this document will include EOS instrument team science software developers and data product designers, DAAC personnel, and end users of EOS data products such as scientists and researchers.

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4. Product Inventory

4.1 HDF-EOS 2.7 Tar File Listing

A listing of the tar file “HDF-EOS2.7v1.00.tar.Z” follows:

1432637061	9635840	/HDF-EOS2.7v1.00/HDF-EOS2.7v1.00.tar
3276172134	13596	/HDF-EOS2.7v1.00/hdfeos/.cmake.state
3765787596	6911	/HDF-EOS2.7v1.00/hdfeos/Makefile
2199271851	569	/HDF-EOS2.7v1.00/hdfeos/make_exclude_list
4153184903	29561	/HDF-EOS2.7v1.00/hdfeos/bin/INSTALL-HDFEOS
751523542	17503	/HDF-EOS2.7v1.00/hdfeos/bin/tmp/hdfeos_env.csh.tmp
2429053957	16125	/HDF-EOS2.7v1.00/hdfeos/bin/tmp/hdfeos_env.ksh.tmp
2047930797	8872	/HDF-EOS2.7v1.00/hdfeos/doc/HDFEOS- DEFINITION.TXT
2808264574	17823	/HDF-EOS2.7v1.00/hdfeos/doc/README
559035267	614	/HDF-EOS2.7v1.00/hdfeos/include/HDFEOSVersion.h
3266043977	10527	/HDF-EOS2.7v1.00/hdfeos/include/HdfEosDef.h
2496326951	82647	/HDF-EOS2.7v1.00/hdfeos/include/cfortHdf.h
3048893625	783	/HDF-EOS2.7v1.00/hdfeos/include/cproj.h
104189215	779	/HDF-EOS2.7v1.00/hdfeos/include/ease.h
1041273117	3439	/HDF-EOS2.7v1.00/hdfeos/include/isin.h
1655398781	2143	/HDF-EOS2.7v1.00/hdfeos/include/proj.h
509190742	1169484	/HDF-EOS2.7v1.00/hdfeos/lib/tmp/geolibDEC.a
2156677141	1146412	/HDF-EOS2.7v1.00/hdfeos/lib/tmp/geolibHP.a
2981673750	282586	/HDF-EOS2.7v1.00/hdfeos/lib/tmp/geolibIBM.a
2684090119	597480	/HDF-EOS2.7v1.00/hdfeos/lib/tmp/geolibIRIX53.a
2794338530	714532	/HDF-EOS2.7v1.00/hdfeos/lib/tmp/geolibIRIX62-32.a
1747333576	794084	/HDF-EOS2.7v1.00/hdfeos/lib/tmp/geolibIRIX62-64.a
1618369724	603700	/HDF-EOS2.7v1.00/hdfeos/lib/tmp/geolibIRIX62- 64mips3.a
2210522388	598260	/HDF-EOS2.7v1.00/hdfeos/lib/tmp/geolibIRIX62-n32.a
1725283110	798644	/HDF-EOS2.7v1.00/hdfeos/lib/tmp/geolibIRIX65-64.a
2245256987	1006888	/HDF-EOS2.7v1.00/hdfeos/lib/tmp/geolibSOL24.a
1768686479	229480	/HDF-EOS2.7v1.00/hdfeos/lib/tmp/geolibSUN4.a
4175914699	508	/HDF-EOS2.7v1.00/hdfeos/make/CLSInstall.sh
1517364602	4119	/HDF-EOS2.7v1.00/hdfeos/make/Makefile.instr
455902311	1171	/HDF-EOS2.7v1.00/hdfeos/make/Makefile.template
1708850785	13017	/HDF-EOS2.7v1.00/hdfeos/make/make.options
686170178	2339	/HDF-EOS2.7v1.00/hdfeos/make/make.targets
439097116	2355	/HDF-EOS2.7v1.00/hdfeos/make/makeidl.include
3220296200	2568	/HDF-EOS2.7v1.00/hdfeos/make/makeidlxx.include
3567045030	1865	/HDF-EOS2.7v1.00/hdfeos/make/makerec.include

733834203	458	/HDF-EOS2.7v1.00/hdfeos/make/makerec.template
2115695411	1387	/HDF-EOS2.7v1.00/hdfeos/samples/AppendField.c
4070186593	2742	/HDF-EOS2.7v1.00/hdfeos/samples/DefineFields.c
2483950413	2295	/HDF-EOS2.7v1.00/hdfeos/samples/DefineGDflds.c
1941092955	3308	/HDF-EOS2.7v1.00/hdfeos/samples/DefineLevels.c
1643716892	3614	/HDF-EOS2.7v1.00/hdfeos/samples/InquireGrid.c
2532455472	4021	/HDF-EOS2.7v1.00/hdfeos/samples/InquireSwath.c
2475311463	2765	/HDF-EOS2.7v1.00/hdfeos/samples/README
2665423228	1230	/HDF-EOS2.7v1.00/hdfeos/samples/ReadFields.c
2330931874	749	/HDF-EOS2.7v1.00/hdfeos/samples/ReadGDflds.c
1175182293	2913	/HDF-EOS2.7v1.00/hdfeos/samples/ReadLevels.c
3768148998	3520	/HDF-EOS2.7v1.00/hdfeos/samples/SetupGrid.c
334694603	1126	/HDF-EOS2.7v1.00/hdfeos/samples/SetupPoint.c
2044823616	3596	/HDF-EOS2.7v1.00/hdfeos/samples/SetupSwath.c
1131293480	1295	/HDF-EOS2.7v1.00/hdfeos/samples/SubsetGrid.c
3350127139	1514	/HDF-EOS2.7v1.00/hdfeos/samples/SubsetPoint.c
2354443423	1601	/HDF-EOS2.7v1.00/hdfeos/samples/SubsetSwath.c
3733161892	1264	/HDF-EOS2.7v1.00/hdfeos/samples/UpdateLevels.c
3470248050	2225	/HDF-EOS2.7v1.00/hdfeos/samples/WriteFields.c
848736619	1313	/HDF-EOS2.7v1.00/hdfeos/samples/WriteGDflds.c
2081004055	3634	/HDF-EOS2.7v1.00/hdfeos/samples/WriteLevels.c
1482570695	1589	/HDF-EOS2.7v1.00/hdfeos/samples/appendfield.f
3059019073	3171	/HDF-EOS2.7v1.00/hdfeos/samples/definefields.f
2858794458	1506	/HDF-EOS2.7v1.00/hdfeos/samples/definegdflds.f
2526701911	4000	/HDF-EOS2.7v1.00/hdfeos/samples/definelevels.f
2446680929	156	/HDF-EOS2.7v1.00/hdfeos/samples/fixedBuoy0.txt
611905679	720	/HDF-EOS2.7v1.00/hdfeos/samples/fixedBuoy1.txt
1439165887	720	/HDF-EOS2.7v1.00/hdfeos/samples/fixedBuoy1s.txt
4064515715	93	/HDF-EOS2.7v1.00/hdfeos/samples/floatBuoy0.txt
766697626	1550	/HDF-EOS2.7v1.00/hdfeos/samples/floatBuoy1.txt
3243080034	3791	/HDF-EOS2.7v1.00/hdfeos/samples/inquiregrid.f
3415311940	3228	/HDF-EOS2.7v1.00/hdfeos/samples/inquireswath.f
329596563	1254	/HDF-EOS2.7v1.00/hdfeos/samples/readfields.f
3699545549	847	/HDF-EOS2.7v1.00/hdfeos/samples/readgdflds.f
2295858073	2762	/HDF-EOS2.7v1.00/hdfeos/samples/readlevels.f
814838569	4132	/HDF-EOS2.7v1.00/hdfeos/samples/setupgrid.f
1681894116	1309	/HDF-EOS2.7v1.00/hdfeos/samples/setuppoint.f
3651293029	3616	/HDF-EOS2.7v1.00/hdfeos/samples/setupswath.f
907968478	651	/HDF-EOS2.7v1.00/hdfeos/samples/simple.txt
2545431992	1276	/HDF-EOS2.7v1.00/hdfeos/samples/subsetgrid.f
3521603892	1604	/HDF-EOS2.7v1.00/hdfeos/samples/subsetpoint.f
1346280758	2080	/HDF-EOS2.7v1.00/hdfeos/samples/subsetswath.f
3990920395	1119	/HDF-EOS2.7v1.00/hdfeos/samples/updatelevels.f
2164760573	2400	/HDF-EOS2.7v1.00/hdfeos/samples/writefields.f
840222205	1310	/HDF-EOS2.7v1.00/hdfeos/samples/writegdflds.f

2900336605	3866	/HDF-EOS2.7v1.00/hdfeos/samples/writelevels.f
3021333668	133441	/HDF-EOS2.7v1.00/hdfeos/src/EHapi.c
2932432138	422321	/HDF-EOS2.7v1.00/hdfeos/src/GDapi.c
1973810693	2195	/HDF-EOS2.7v1.00/hdfeos/src/Makefile
408808278	1505	/HDF-EOS2.7v1.00/hdfeos/src/Makefile_CM
2005347297	1538	/HDF-EOS2.7v1.00/hdfeos/src/Makefile_alt
553924875	233082	/HDF-EOS2.7v1.00/hdfeos/src/PTapi.c
349653436	452309	/HDF-EOS2.7v1.00/hdfeos/src/SWapi.c
995720388	767	/HDF-EOS2.7v1.00/hdfeos/src/make_IT/makeDEC4.0r1
3113958064	721	/HDF-EOS2.7v1.00/hdfeos/src/make_IT/makeHP4.0r1
3759080986	728	/HDF-EOS2.7v1.00/hdfeos/src/make_IT/makeIBM4.0r1
2378040899	722	/HDF-EOS2.7v1.00/hdfeos/src/make_IT/makeSGI4.0r1
1467987716	748	/HDF-EOS2.7v1.00/hdfeos/src/make_IT/makeSUN4.0r1
2932675865	3190	/HDF-EOS2.7v1.00/hdfeos/src/make_IT/makeinc

4.2 HDF-EOS2.7v1.00_TestDrivers.tar Listing

3277963665	931840	/HDF-EOS2.7v1.00_TestDrivers/HDF-EOS2.7v1.00_TestDrivers.tar
1928149120	2226	/HDF-EOS2.7v1.00_TestDrivers/hdfeos/testdrivers/README
2096896467	222065	/HDF-EOS2.7v1.00_TestDrivers/hdfeos/testdrivers/grid/testgrid.c
2077748214	74943	/HDF-EOS2.7v1.00_TestDrivers/hdfeos/testdrivers/grid/testgrid.f
823022450	31750	/HDF-EOS2.7v1.00_TestDrivers/hdfeos/testdrivers/grid/testgridf90-32.f
1723358445	2482	/HDF-EOS2.7v1.00_TestDrivers/hdfeos/testdrivers/grid/tutils.h
2537038551	135	/HDF-EOS2.7v1.00_TestDrivers/hdfeos/testdrivers/point/fixedBuoy0.txt
1531248358	680	/HDF-EOS2.7v1.00_TestDrivers/hdfeos/testdrivers/point/fixedBuoy1.txt
2811663699	680	/HDF-EOS2.7v1.00_TestDrivers/hdfeos/testdrivers/point/fixedBuoy1s.txt
961403394	81	/HDF-EOS2.7v1.00_TestDrivers/hdfeos/testdrivers/point/floatBuoy0.txt
2079259380	1500	/HDF-EOS2.7v1.00_TestDrivers/hdfeos/testdrivers/point/floatBuoy1.txt
95646741	630	/HDF-EOS2.7v1.00_TestDrivers/hdfeos/testdrivers/point/simple.txt
2269620415	74670	/HDF-EOS2.7v1.00_TestDrivers/hdfeos/testdrivers/point/testpoint.c
1770192493	67441	/HDF-EOS2.7v1.00_TestDrivers/hdfeos/testdrivers/point/testpoint.f
448738500	42519	/HDF-EOS2.7v1.00_TestDrivers/hdfeos/testdrivers/point/testpointf90-32.f
1723358445	2482	/HDF-EOS2.7v1.00_TestDrivers/hdfeos/testdrivers/point/tutils.h
1309152130	239072	/HDF-EOS2.7v1.00_TestDrivers/hdfeos/testdrivers/swath/testswath.c
2891879728	95575	/HDF-EOS2.7v1.00_TestDrivers/hdfeos/testdrivers/swath/testswath.f
869828863	48290	/HDF-

1723358445	2482	EOS2.7v1.00_TestDrivers/hdfeos/testdrivers/swath/testswathf90-32.f /HDF-EOS2.7v1.00_TestDrivers/hdfeos/testdrivers/swath/tutils.h
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4.3 Documentation

The documents provided with this release are:

Document Number: 170-TP-600-001

Title: HDF-EOS Library Users Guide for the ECS Project-Volume 1: Overview
and Examples

Delivery Source: Hardcopy, WEB

Document Number: 170-TP-601-001

Title: HDF-EOS Library Users Guide for the ECS Project-Volume 2: Function
Reference Guide

Delivery Source: Hardcopy, WEB

4.4 Archive Tape

The following magnetic tape is used to archive the delivered baseline configuration of the developed software.

904-PR-102-101

Tape label: ECS 6A HDF-EOS 2.7v1.00

Distribution Date: November 17, 2000

>>> 3.0gbyte format (low density) <<<

Filenames: HDF-EOS2.7v1.00.README

HDF-EOS2.7v1.00.tar.Z

HDF-EOS2.7v1.00_TestDrivers.tar.Z

HDF-EOS2.7v1.00_TestDrivers.README

5. Non-Conformance Status

5.1 Known Problems with HDF-EOS 2.7

This section contains the list of problems closed (section 5.2) and known problems (section 5.3) as of 11/10/2000 in the HDF-EOS 2.7 delivery. These problems were found and recorded during unit and integration and captured in the formal problem tracking system, Distributed Defect Tracking System (DDTS). The DDTS system generated the attached list of “closed” NCRs. HITC management has reviewed this list and HDF-EOS is considered to be acceptable for delivery at this time. The list includes the NCR ID, Title, Description, and Status. DDTS Problem Severity Definitions, on a 1-5 scale, are defined as follows:

- 1 Catastrophic and severely broken and no workaround.
Example: can't use major product function.
- 2 A severe defect that must be fixed but there is a workaround.
Example: user data must be modified to work.
- 3 A defect that must be fixed, but the system can be deployed with it.
Example: A rarely used Tool won't work on a rarely used platform.
- 4 A defect that causes small impact. Easy to recover or workaround.
Example: error messages aren't very clear.
- 5 An enhancement request.
Example: bad layout or misuse of grammar in manual.

The status of the NCRs corrected for this release is included in section 5.2. This NCR report reflects the information obtained from DDTS on November 10, 2000. To obtain a detailed description of the NCRs, the DDTS system can be accessed from the following WEB page:

<http://newsroom.gsfc.nasa.gov/sit/ddts/ddts.html>

5.2 HDF-EOS 2.7 Non-Conformance Reports (Close Status)

The following HDF-EOS problems, listed in numerical order by severity, were closed with the HDF-EOS 2.7 Release:

NCR ID:	ECSed25875
Title:	Un-updated index mapping values are required for fixed scene acquire
Severity:	2
Problem:	SWupdateidxmap will return updated index mapping values which are not expected by reformatting code for the current design.
Resolution:	Modified HDF-EOS library so the index mapping indices are not updated. The function affected was SWupdateidxmap. This was done because the Landsat 7 reformatting code was changed.
NCR ID:	ECSed26831
Title:	function gdfldinfo core dumps
Severity:	2

Problem: In the function GDfldinfo of /ecs/hdfeos/src/GDapi.c memory is allocated dynamically for dimlist. However, since fortndimlist is an output, users may pass it to this function without specifying the length. This will cause problem. We need to assign memory for dimlist statically.

Resolution: In the function GDfldinfo of the file /ecs/hdfeos/src/GDapi.c allocated memory statically for the dimlist.

NCR ID: ECSed26805

Title: PTdeflevel in PTapi.c fails because of some HDF limits.

Severity: 2

Problem: In PTdeflevel function in PTapi.c the function VSSizeof() retruns "-1" when some HDF limits are exceeded. This results in core dump.

Resolution: In the file /ecs/hdfeos/src/PTapi.c:

In the PTdeflevel function modified:

```
        VSfdefine(vdataID, utlbuf, fieldtype[i], order);
    }

    /* Set all fields within vdata */
    /* ----- */
    VSsetfields(vdataID, fieldlist);

    /* Get size in bytes of vdata record */
    /* ----- */
    size = VSSizeof(vdataID, fieldlist);
to:

    status = VSfdefine(vdataID, utlbuf, fieldtype[i], order);
    if(status != 0)
    {
        status = -1;
        HEpush(DFE_GENAPP, "PTdeflevel", __FILE__, __LINE__);
        HReport("Cannot define %d th field. One probable cause
        can be exceeding of HDF's limits for MAX_ORDER and/or
        MAX_FIELD_SIZE \"%d\".\n", i+1, MAX_ORDER);
        break;
    }
}

if(status == 0)
{
    /* Set all fields within vdata */
    /* ----- */
    status = VSsetfields(vdataID, fieldlist);
    if(status != 0)
    {
        status = -1;
        HEpush(DFE_GENAPP, "PTdeflevel", __FILE__, __LINE__);
        HReport("Cannot set fields. Probably exceeded HDF's
        limit
        MAX_FIELD_SIZE \"%d\" for the vdata\n", MAX_FIELD_SIZE);
    }
}
```

```

        if(status == 0)
        {
            /* Get size in bytes of vdata record */
            /* ----- */
            size = VSSizeof(vdataID, fieldlist);
            if(size <= 0)
            {
                status = -1;
                HEpush(DFE_GENAPP, "PTdeflevel", __FILE__, __LINE__);
                HHereport("Size of Vdata is not greater than zero.\n");
            }
        }

        if(status == 0)
        {
            .....
        }
    }

```

NCR ID: ECSed25146

Title: Incorrect use of format "%lf" in function sprintf.

Severity: 3

Problem: sprintf and printf only keep 7 significant digits when used with %lf for float (32bit) as well as for double precision (64bit). While it is OK for float, it causes precision loss for double precision data. Use format %.16G will keep all the 16 significant digits for double precision data type.

Resolution: Change the %lf format to %.16G in GDapi.c lines 366, 369 and 985, where double precision data is involed in function call sprintf.

NCR ID: ECSed28694

Title: Need to add code 31 for ISINUS Grid

Severity: 3

Problem: New GCTP package has ISINUS projection as its 31st projection. The OLD GCTP package that we currently have in the TOOLKIT did not have this projection, so ECS added this to the package and assigned code 99 for this projection. We need to also add code 31 for this projection so that ISINUS projection can be used with either code 31 or 99.

Resolution: Added code 31 for ISINUS projection in a few TOOLKIT (GCT) and HDFEOS header files, and modified GDapi.c and a few tools in TOOLKIT (GCT tools) so that one can use projection code 31 for ISINUS projection in addition to code 99.

NCR ID: ECSed27384

Title: Structure metadata buffer needs to be filled with zeros when it is partially initialized

Severity: 3

Problem: For Structure metadata the metabuf is initialized with calloc, and calloc initializes the space with zeros. When EHinsertmeta in the file EHapi.c needs to grow the metabuf beyond the initial 32K, it does so using realloc, but realloc does *not* initialize the new space. So the last 32K buffer, unless it's filled with exactly 32K

of struct metadata, will contain garbage following the struct meta's "END" statement.

Resolution: In the file /ecs/hdfeos/src/EHapi.c added the line

```
memset((metabuf + metalen + seglen), '\0', (nmeta*32000 -1 -
(metalen + seglen)));
```

to the function EHinsertmeta to avoid having structure metadata filled with garbage when it is not completely filled with metadata.

NCR ID: ECSed28172

Title: Cylindrical EASE grid is needed in grid api for HDFEOS

Severity: 5

Problem: An ESD (no. 102) directs implementing Cylindrical EASE grid in the HDFEOS api. The projection is "25-km EASE grid global, cylindrical equal-area projection, true at 30-deg N & S.

Resolution: Added two new functions bceafor() and bceainv() to the TOOLKIT's GCT freware tools and modified TOOLKIT's proj.h, PGS_GCT.f, GS_GCT.h, GS_GCT_Prototypes.h, PGS_GCT_Init.c, PGS_GCT_Proj.c, for_init.c, and inv_init.c to implement Behrmann Cylindrical Equal-Area projection.

Modified HDFEOS's HdfEosDef.h, and GDapi.c, and added ease.h to implement "25 Km global EASE Grid".

Modified /ecs/hdfeos/testdrivers/grid/testgrid.c to include tests for EASE grid, and replaced existing GCTP libraries with new ones in the directory /ecs/hdfeos/lib/tmp/. (gctp libraries that has not been replaced yet are:

geolibIRIX53.a, geolibIRIX62-64mips3.a, geolibSUN4.a, and geolibIBM.a). Also added gctp library geolibIRIX65-64.a to /ecs/hdfeos/lib/tmp directory.

Note: Also modified PGS_SMF.h and GDapi.c files to update HDFEOS and TOOLKIT versions to 2.7.

NCR ID: ECSed23363

Title: SMC/GSFC no embedded versioning on HDFEOS in 4PY

Severity: 3

Problem: The Drop 4PY HDFEOS libraries and other files have no embedded versioning (the "what" command).

Resolution: Under ~/hdfeos/src, added 2 new lines into the file EHapi.c. These lines are:

```
#define HDFEOSVERSION1 "2.6"
#include
```

-Under ~/hdfeos/include, a the new file HDFEOSVersion.h was created.

NCR ID: ECSed26227

Title: HDF-EOS library bus error with MODIS swath data
Severity: 3
Problem: MODIS recently began including geolocation data in their MOD29 and MOD10_L2 swath products. However, attempting to perform subsetting operations on these data causes fatal errors in the HDF-EOS library. These data use an offset and increment to map the geolocation data to the science data.
Resolution: There is a difference for the global variable MAX_NC_NAME between versions HDF4.1r1 and HDF4.1r3. We believe this is because of a bug in HDF. We will ask NCSA about the difference and ask for a change to fix the problem. In the meantime, we have modified the HDF-EOS library so it is possible to ingest GDAS granules.

5.3 HDF-EOS 2.7 Non-Conformance Reports (Open Status)

The following NCRs, listed in numerical order by severity, are liens against the HDF-EOS 2.7 delivery:

NCR ID: ECSed10922
Title: HDF-EOS library has return values not being tested
Severity: 5
Description: The HDF-EOS library has functions that the return values are not being tested for correct return values. Small errors could be propagating through the library.

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Appendix A. Build/Installation Instructions

Build/installation instructions for HDF-EOS are located in Appendix A of the HDF-EOS Users Guide (170-TP-600-001) and in the README file available with the HDF-EOS delivery.

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Appendix B. User Feedback Procedures

The mechanism for handling user feedback, documentation and software discrepancies, and bug reports follows:

- a. Accounts at the ECS Landover facility have been set up for user response:
pgstlkit@eos.east.hitc.com
- b. Users will e-mail problem reports and comments to the above account. A receipt will be returned to the sender. A work-off plan for the discrepancy will be developed and status report issued once a month. Responses will be prioritized based on the severity of the problem and the available resources. Simple bug fixes will be turned around sooner, while requested functional enhancements to the Toolkit will be placed in a recommended requirements database (RRDB) and handled more formally.
- c. In order to help expedite responses, we request the following information be supplied with problem reports:
 - Name:
 - Date:
 - EOS Affiliation (DAAC, Instrument, ESDIS, etc.):
 - Phone No.:
 - Development Environment:
 - Computing Platform:
 - Operating System:
 - Compiler and Compiler Flags:
 - Tool Name:
 - Problem Description:
 - (Please include exact inputs to and outputs from the toolkit call, including error code returned by the function, plus exact error message returned where applicable.)
 - Suggested Resolution (include code fixes or workarounds if applicable):
- d. In addition to the e-mail response mechanism, a phone answering machine is also provided. The telephone number is 1-800-ECS-DATA. Calls will be returned as soon as possible. Note, however, that e-mail is the preferred method of responding to users.

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Appendix C. Test Baseline Configuration

The HDF-EOS library was built and tested in a multi-platform environment using the following platforms, operating systems, and compilers:

Table C-1. HDF-EOS Development Configuration

Platform	OS	Version	C Compiler	FORTRAN
DEC Alpha	Digital Unix	4.0d	DEC C 5.2	DEC FORTRAN 5.2
HP 9000/770	HP-UX	A.10.20	HP C 10.32	HP FORTRAN 10.24
IBM RS-6000	AIX	4.3	IBM C 3.1.4	IBM FORTRAN 3.2.5
SGI Power Challenge	IRIX	6.5	SGI C 7.2.1	SGI FORTRAN 7.2.1
Sun Sparc	Solaris	2.5.1(5.5.1)	Sun C 4.2	Sun FORTRAN 4.2

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Abbreviations and Acronyms

A.A.	Astronomical Almanac
AA	Ancillary Data Access
AIRS	Atmospheric Infrared Sounder
API	Application Program Interface
APID	Application Process Identifier
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer
BNF	Bachus-Nauer Form
CBP	Celestial Body Position
CCR	Configuration Change Request
CCSDS	Consultative Committee on Space Data Systems
CDRL	Contract Deliverable Requirements List
CERES	Clouds and Earth Radiant Energy System
COTS	Commercial off-the-shelf Software
CSMS	Communications and Systems Management Segment (ECS)
CRC	Cyclic Redundancy Code
CSC	Coordinate System Conversion
CUC	Constant and Unit Conversions
DAAC	Distributed Active Archive Center
DCE	Distributed Computing Environment
DCN	Document Change Notice
DCW	Digital Chart World
DDF	Data Distribution Facility
DEM	Digital Elevation Model
DDTS	Distributed Defect Tracking System
DPFT	Data Processing Focus Team
DTM	Digital Terrain Model
ECI	Earth Centered Inertial

ECR	Earth Centered Rotating
ECS	EOSDIS Core System
EDHS	ECS Data Handling System
EDOS	EOS Data and Operations System
EOS	Earth Observing System
EOSAM	EOS AM Project (morning spacecraft series)
EOSDIS	EOS Data and Information System
EOSPM	EOS PM Project (afternoon spacecraft series)
EPH	Ephemeris Data Access
ESDIS	Earth Science Data and Information System
ET	Ephemeris Tool
FDF	Flight Dynamics Facility
FOV	Field-of-View
ftp	file transfer protocol
GAST	Greenwich Apparent Sidereal Time
GCT	Geo-Coordinate Transformation
GMST	Greenwich Mean Sidereal Time
GPS	Global Positioning System
GSFC	Goddard Space Flight Center
HAIS	Hughes Applied Information Systems
HDF	Hierarchical Data Format
HDF-EOS	Hierarchical Data Format - Earth Observing System
HITC	Hughes Information Technology Company
http	hypertext transport protocol
I&T	Integration & Test
I/O	input/output
IEEE	Institute of Electrical and Electronic Engineers
IMS	Information Management System (ECS)
IWG	Investigator Working Group
JPL	Jet Propulsion Laboratory

LaRC	Langley Research Center
MOO	Maintain and Operation
MCF	Metada Configuration File
MDUE	Missing Data Unit Entry
MEM	Memory Management
MET	Metadata
MODIS	Moderate-Resolution Imaging Spectroradiometer
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
NCR	Nonconformance Report
NCSA	National Center for Supercomputer Applications
netCDF	network Common Data Format
NMC	National Meteorological Center
PACOR	Packet Processor
PC	Process Control
PGE	Product Generation Executive
PCF	Process Control File
PDS	Production Data Set
PDPS	Planning & Data Production System
PCF	Process Control File
PDR	Preliminary Design Review
PGE	Product Generation Executive (formerly Product Generation Executable)
PGS	Product Generation System (ECS)
PGSTK	Product Generation System Toolkit
POSIX	Portable Operating System Interface for Computer Environments
QA	Quality Assurance
QAC	Quality and Accounting Capsule
RDBMS	Relation Data Base Management System
RPC	Remote Procedure Calls
RRDB	Recommended Requirements Database

SCF	Science Computing Facility
SDP	Science Data Production
SES	Scheduling and Execution Subsystem
SDPS	Science Data Processing Segment
SDPF	Science Data Processing Facility
SGI	Silicon Graphics International
smf	Collection of utilities and library routines used for generating SMFs and manipulating SMF-defined status values and messages
SMF	Status Message File
SPSO	Science Processing Support Office
SSM/I	Special Sensor for Microwave Imaging
TAI	International Atomic Time
TBD	To Be Determined
TD	Time Date Conversion
TDB	Barycentric Dynamical Time
TDRSS	Tracking and Data Relay Satellite System
TDT	Terrestrial Dynamical Time
TLCF	Team Leader Computing Facility
TRMM	Tropical Rainfall Measuring Mission (Joint US - Japan)
TSS	(TDRSS) Service Session
UARS	Upper Atmosphere Research Satellite
URL	Universal Research Locator
US	United States
USNO	U.S. Naval Observatory
UT	Universal Time
UTC	Universal Coordinated Time
UTCf	Universal Time Correlation Factor
UTM	Universal Transverse Mercator
VCDU	Virtual Channel Data Unit
VDD	Version Description Document

VPF	Vector Product Format
WWW	World Wide Web

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